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(54) **INFLATABLE GARMENT FOR INTERMITTENT COMPRESSION THERAPY.**

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Description

Technical Field

This invention relates to an inflatable garment for use in intermittent compression therapy and more particularly to a garment having a portion which substantially encases a patient's foot to be treated. Such a garment may also further include a leg portion which encases substantially the whole leg i.e. both calf and thigh; the lower leg i.e. calf; or which further includes only an ankle portion. However, the present invention is concerned with improvements to the foot portion of such a garment and reference herein to leg garment is to be understood as including any of the garment forms referred to above.

Background Art

Known inflatable leg garments are formed from a double skinned fabric blank which comprises integral mirror image leg-shaped parts. The blank is folded in half so that the leg shaped parts are brought into superposed relationship. Thereafter, a zip fastener is inserted in order to provide an openable front seam and the foot portions of the leg-shaped parts are welded and stitched together thereby forming a generally leg-shaped inflatable enclosure having a zip seam 's' and a welded seam 'w' as shown in FIGURE 7.

In use, the garment is fitted about a patient's limb to be treated and cyclically is inflated and deflated to apply intermittent compression to the patient's limb. Whilst the known garment construction is generally satisfactory, the pressure applied by the foot portion during inflation of the garment can cause considerable pain to the patient because of the constricting shape which the foot portion of the garment is caused to adopt during inflation.

DE—A—24 30 651 discloses a foot massaging device which includes fluid receiving chambers which, in use, are positioned above and below the wearer's foot. However this device is relatively complex and time consuming to manufacture.

The present invention seeks to improve the configuration of the garment foot portion so as to provide an equivalent or improved intermittent compression therapy as compared with that given by known garment constructions whilst giving a construction which is simple to produce better comfort to the user and which alleviates pain.

US—A—3 824 992 discloses a pressure garment for aiding blood circulation which comprises a double skinned envelope of which the inner envelope has breathing pores for the passage of air along the skin of the wearer to relieve discomfort. However, there is no suggestion in this pressure garment of relieving discomfort caused by the manner in which pressure is applied to a wearer's foot which is the essence of the present invention.

The inflatable garment as defined in Claim 1 fulfills the aforesaid conditions.

Embodiments of the invention will now be

described, by way of example, with reference to the accompanying drawings, in which:—

FIGURE 1 is a plan view of a preferred fabric blank comprising two superposed sheets of material secured together to form an inflatable garment;

FIGURE 2 is a perspective view of a garment in inflated condition as seen from the underside of the foot portion and formed from the fabric blank shown in FIGURE 1;

FIGURE 3 is a plan view of another fabric blank comprising two superposed sheets of material secured together to form an inflatable garment;

FIGURE 4 is a perspective view of a garment in inflated condition as seen from the underside of the foot and formed from the fabric blank shown in FIGURE 3;

FIGURE 5 is a plan view of yet another fabric blank comprising two superposed sheets of material secured together to form an inflatable garment; and

FIGURE 6 is a perspective view of a garment in inflated condition as seen from the underside of the foot portion and formed from the fabric blank shown in FIGURE 4.

FIGURE 7 is a perspective view of a known garment in inflated condition as seen from the underside of the foot portion.

Best Mode for Carrying Out the Invention

Referring first to FIGURES 1 and 3, there is shown a leg garment blank 10 for forming an inflatable garment 12. The blank is formed from two superposed sheets 14, 16 of material which will form outer and inner 'skins' of the garments, each comprising a woven Nylon (registered trade mark) substrate to one face of which a polyurethane coating is applied. The sheets are high frequency welded together adjacent their peripheries with their coated surfaces juxtaposed so that a continuous peripheral seal 18 is formed. An inflation socket 20 is welded about an aperture provided in the outer sheet 14 so that the garment can be attached to a source of pressure fluid and inflated. A zip fastener 22, 24 is stitched to the opposed sides of the blank so as to form a central forward facing openable seam 26 on the garment.

In this embodiment which is a preferred form of the invention, the coated material used produces a fluidtight garment. However, it is envisaged that the garment need not be wholly fluidtight provided that the fluid leakage therefrom during inflation is less than the volume of fluid supplied.

Indeed, it is envisaged that the inner skin of the garment may be formed of a porous material or one which is given porosity by the formation therein of a multiplicity of orifices, thereby providing a 'vented' garment. It is thought that such a vented garment may have the advantage of cooling and/or ventilating the patient's skin in the area where the garment is worn and also in accelerating wound healing where an open wound is present in such area. The feature of providing a vented garment is not restricted to the foot or leg garments described herein but is applicable to

garments adapted to be worn on other parts of the body e.g. arm garments which may comprise a simple double-skinned sleeve with or without an openable seam such as a zip fastener.

The blank includes a sole portion 28 which, in part, is defined by peripheral seal portion 18c and a weld seam 30. Weld seam 30 extends from the junction between peripheral seal portions 18a and 18b towards, but stopping short of the end edge 32 of the blank and seals sheets 14 and 16 together along its length. A gap 'g' is left between the sheets of material through which pressure fluid e.g. air can flow to inflate the sole portion 28 during inflation of the garment.

In order to form the completed garment, marginal parts of the sheets adjacent the peripheral seal portions 18a and 18b are secured together as by stitching, and likewise, marginal parts of the sheets adjacent the peripheral seal portions 18c and 18d are secured together to form seal 34 (FIGURE 2).

When the garment 12 is worn during use and inflated, the foot portion 36 is caused to form three distended 'sacs' S1, S2 and S3 respectively. Sac S1 is formed by inflation of the sole portion 28 between seams 30 and 34. The inner surface 38 of sac S1 provides a 'platform' which meets a substantially horizontal notional plane 'h' passing through the foot portion on which a patient's foot rests. Pressure is applied upwardly by sac S1. Sacs S2 and S3 are formed by parts of the foot portion between seams 26/34 and 26/30 respectively, each of which has an inner surface 40, 42 which applies pressure generally downwardly towards the notional horizontal plane 'h' containing inner surface 38 of sac S1.

Hence, pressure is applied to a patient's foot by inflation of the three sacs predominantly from above and from below a horizontal plane passing through the foot portion of the garment.

In use, the garment cyclically is inflated and deflated so as to apply an intermittent compression therapy to a patient's leg and foot. When the foot portion is constructed as described above, the patient's foot is allowed to remain substantially flat and straight between the sacs so that discomfort arising from pinching of the skin or sideways squeezing of the foot and toes is minimized.

FIGURES 3 and 4 illustrate a further embodiment of the invention in which a leg garment blank 10' is provided to form an inflatable garment 12'. As in the previous embodiment, the blank is formed from two superposed sheets 14', 16' of material welded together adjacent their peripheries to form a continuous peripheral seal 18'. An inflation socket 20' is provided in outer sheet 14' and a zip fastener 22', 24' is stitched to the opposed sides of the blank 10' so as to form a central, forward facing openable seam 26' on the garment.

The blank includes a sole portion 28' which is defined, in part, by peripheral seal portions 18e' and 18f'.

In order to form the completed garment, marginal parts of the sheets adjacent peripheral seal portions 18e' and 18g' are secured together as by

stitching, and likewise marginal parts of the sheets adjacent the peripheral seal portions 18f' and 18h' are also stitched together.

When the garment 12' is worn during use and inflated, foot portion 36' is caused to form three distended 'sacs' S4, S5 and S6, respectively. Sac S4 is formed by inflation of the sole portion 28' between seams 18g'—18e' and 18f'—18h'. The inner surface 38' of sac S4 provides a 'platform' which meets a substantially horizontal plane 'h1' passing through the foot portion on which a patient's foot rests. Pressure is applied upwardly by sac S4. Sacs S5 and S6 are formed by parts of the foot portion between seams 26'/18e'—18g' and 26'/18f'—18h' respectively, each of which has an inner surface 40', 42' which applies pressure generally downwardly towards the notional plane 'h1' containing inner surface 38' of sac S4.

FIGURES 5 and 6 illustrate a still further embodiment of the invention in which a leg garment blank 44 is provided to form inflatable garment 46. As in the previous embodiments the blank is formed from two superposed sheets 48, 50 of material welded together adjacent their peripheries to form a continuous peripheral seal 52. An inflation socket 54 is provided in outer sheet 48 and a zip fastener 56, 58 is stitched to the opposed sides of the blank 44 so as to form a central, forward facing, openable seam 60 on the garment.

The blank includes a sole portion 62, 64 which is, in part, defined by peripheral seal portions 52a and 52b and an arcuate weld seam 66 which seals sheets 48 and 50 together along its length. The weld seam 66 may be interrupted intermediate its ends to provide a two-part seam, one part in each side of the foot portion. The weld seam 66 stops short of the end edges 68 and 70 of the blank thus creating gaps g1 and g2 between the sheets of material through which pressure fluid can flow when the garment is inflated.

In order to form the completed garment, marginal parts of the sheet adjacent the peripheral seal portions 52a and 52b are secured together as by stitching to form a central sole seam 72 (FIGURE 6).

When the garment 46 is worn during use and inflated, the foot portion 74 is caused to form four distended 'sacs' S7, S8, S9, S10, respectively. Sacs S7 and S8 are formed by the sole portion 62/64 between the left and right parts of seam 66 and sole seam 72. The inner surfaces 76, 78 of sacs S7 and S8 together provide a 'platform' which meets a substantially horizontal notional plane 'h2' passing through the foot portion on which a patient's foot rests. Pressure is applied upwardly by sacs S7 and S8. Sacs S9 and S10 are formed by parts of the foot portion between the left and right parts of seam 66 and central zip seam 60. Each of sacs S9 and S10 has an inner surface 80 and 82, respectively which applies pressure generally downwardly towards the notional horizontal plane 'h2', containing surfaces 76, 78 of sacs S7 and S8.

FIGURE 7 shows a garment of known construction, which is formed from a blank similar to that shown in FIGURE 5. However, in the known construction, the weld seam 66 is not present, so

that when the garment is inflated, the foot portion forms two 'sacs' SL and SR which apply pressure inwardly about a notional vertical plane 'p'. This arrangement often causes considerable discomfort to a wearer since a restrictive sideways force is applied to the foot as previously referred to.

Claims

1. An inflatable garment (12, 12', 46) for use in intermittent compression therapy which garment is produced from a pair of superposed sheets (14, 16; 14'; 16'; 48, 50) of material welded together adjacent their peripheries thus forming a blank (10; 10'; 44), a sole portion (28; 28'; 62, 64) of the garment being formed by securing together adjacent marginal parts of said blank, said sole portion being part of a foot portion (36, 36', 74) provided by a plurality of inflatable sacs (S), characterised in that the inflatable sacs are arranged such that, when inflated, pressure is applied thereby inwardly of the foot portion predominantly from above and from below a notional substantially horizontal plane (h) passing centrally through the foot portion of the garment.

2. An inflatable garment according to claim 1, further characterised in that a single sac (S₁, S₄) is disposed below said notional substantially horizontal plane which sac has an inner surface (38, 38') which provides a platform on which a wearer's foot is to be rested and an outer surface providing a sole portion (28, 28') of the garment.

3. An inflatable garment according to claim 1, further characterised in that a pair of sacs (S₇, S₈) is disposed below said notional substantially horizontal plane each of which sacs has an inner surface (76, 78) which provides a platform on which a wearer's foot is to be rested and an outer surface providing part of a sole portion (62, 64) of the garment.

4. An inflatable garment according to either of claims 2 or 3, further characterised in that a pair of sacs (S₂, S₃; S₅, S₆; S₉, S₁₀) is disposed above said notional substantially horizontal plane.

5. An inflatable garment according to any of claims 2 to 4, further characterised in that each sac disposed below said notional substantially horizontal plane is defined at least in part by a pair of spaced weld seams formed in the material from which the garment is fabricated.

Patentansprüche

1. Aufblasbares Bekleidungsstück (12, 12', 46) zur Verwendung in der intermittierenden Kompressionstherapie, welches aus einem Paar übereinanderliegender Materiallagen (14, 16; 14', 16'; 48, 50) hergestellt ist, die entlang ihrer Ränder miteinander verschweißt sind und so einen Zuschnitt (10, 10'; 44) bilden, wobei ein Sohlenabschnitt (28, 28'; 62, 64) des Bekleidungsstückes, der Teil eines Fußabschnittes (36, 36', 74) ist, der mit einer Anzahl aufblasbarer Beutel (S) versehen ist, durch Miteinanderverbinden von Randteilen des Zuschnittes ausgebildet ist,

dadurch gekennzeichnet, daß die aufblasbaren Beutel (S) derart angeordnet sind, daß, wenn sie aufgeblasen sind, dadurch Druck innerhalb des Fußabschnittes überwiegend von oberhalb und unterhalb einer gedachten im wesentlichen horizontalen Ebene (h) ausgeübt wird, die zentral durch den Fußabschnitt des Bekleidungsstückes führt.

2. Aufblasbares Bekleidungsstück nach Anspruch 1, dadurch gekennzeichnet, daß ein einzelner Beutel (S₁, S₄) unterhalb der gedachten im wesentlichen horizontalen Ebene angeordnet ist, welcher eine Innenfläche (38, 38') aufweist, die ein Sohlenbett bildet, auf dem der Fuß eines Anwenders ruhen soll, und eine Außenfläche, die einen Sohlenabschnitt (28, 28') des Bekleidungsstückes bildet.

3. Aufblasbares Bekleidungsstück nach Anspruch 1, dadurch gekennzeichnet, daß ein Paar von Beuteln (S₇, S₈) unterhalb der gedachten im wesentlichen horizontalen Ebene angeordnet ist, von denen jeder eine Innenfläche (76, 78) hat, die ein Sohlenbett bildet, auf dem der Fuß eines Anwenders ruhen soll, und eine Außenfläche, die einen Teil eines Sohlenabschnittes (62, 64) des Bekleidungsstückes bildet.

4. Aufblasbares Bekleidungsstück nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß ein Beutelpaar (S₂, S₃; S₅, S₆; S₉, S₁₀) oberhalb der gedachten im wesentlichen horizontalen Ebene angeordnet ist.

5. Aufblasbares Bekleidungsstück nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß jeder Beutel, der unterhalb der gedachten im wesentlichen horizontalen Ebene angeordnet ist, zumindest teilweise durch ein Paar beabstandeter Schweißnähte umrandet ist, die im Material, aus dem das Bekleidungsstück besteht, ausgebildet sind.

Revendications

1. Vêtement gonflable (12, 12', 46) à utiliser dans la thérapie de la compression intermittente, fabriqué à partir de deux feuilles (14, 16, 14', 16', 48, 50) superposées d'un matériau dont les périphéries adjacentes sont soudées ensemble formant ainsi un volume libre (10, 10', 44), une portion de semelle du vêtement étant formée en fixant ensemble les parties extrêmes adjacentes dudit volume libre, ladite portion de semelle faisant partie d'une portion de pied (36, 36', 74) pourvue d'une pluralité de sacs gonflables (S), ce vêtement étant caractérisé par le fait que les sacs gonflables sont disposés de telle manière que, lorsqu'ils sont gonflés, la pression est appliquée à l'intérieur de la portion de pied, essentiellement par le haut et par le bas, un plan (h) imaginaire, sensiblement horizontal, passant par le centre de la portion de pied du vêtement.

2. Vêtement gonflable selon la revendication 1, caractérisé par le fait qu'un sac unique (S₁, S₄) est disposé au-dessous dudit plan imaginaire sensiblement horizontal, ce sac ayant une surface interne (38, 38'), qui fournit une base sur laquelle

le pied de l'utilisateur doit reposer, et une surface externe fournissant une portion de semelle (28, 28') du vêtement.

3. Vêtement gonflable selon la revendication 1, caractérisé par le fait que deux sacs (S7, S8) sont disposés au-dessous dudit plan imaginaire sensiblement horizontal, chacun des sacs ayant une surface interne (76, 78) qui procure une base sur laquelle le pied de l'utilisateur doit reposer et une surface externe fournissant une partie de la portion de semelle (62, 64) du vêtement.

4. Vêtement gonflable selon l'une quelconque

des revendications 2 ou 3, caractérisé par le fait que deux sacs (S2, S3; S5, S6; S9, S10) sont disposés au-dessus dudit plan imaginaire sensiblement horizontal.

5. Vêtement gonflable selon l'une quelconque des revendications 2 à 4, caractérisé par le fait que chaque sac, disposé au-dessous dudit plan imaginaire sensiblement horizontal, est défini, au moins en partie, par une paire de joints soudés formés dans le matériau au moyen duquel le vêtement est fabriqué.

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FIG. 1

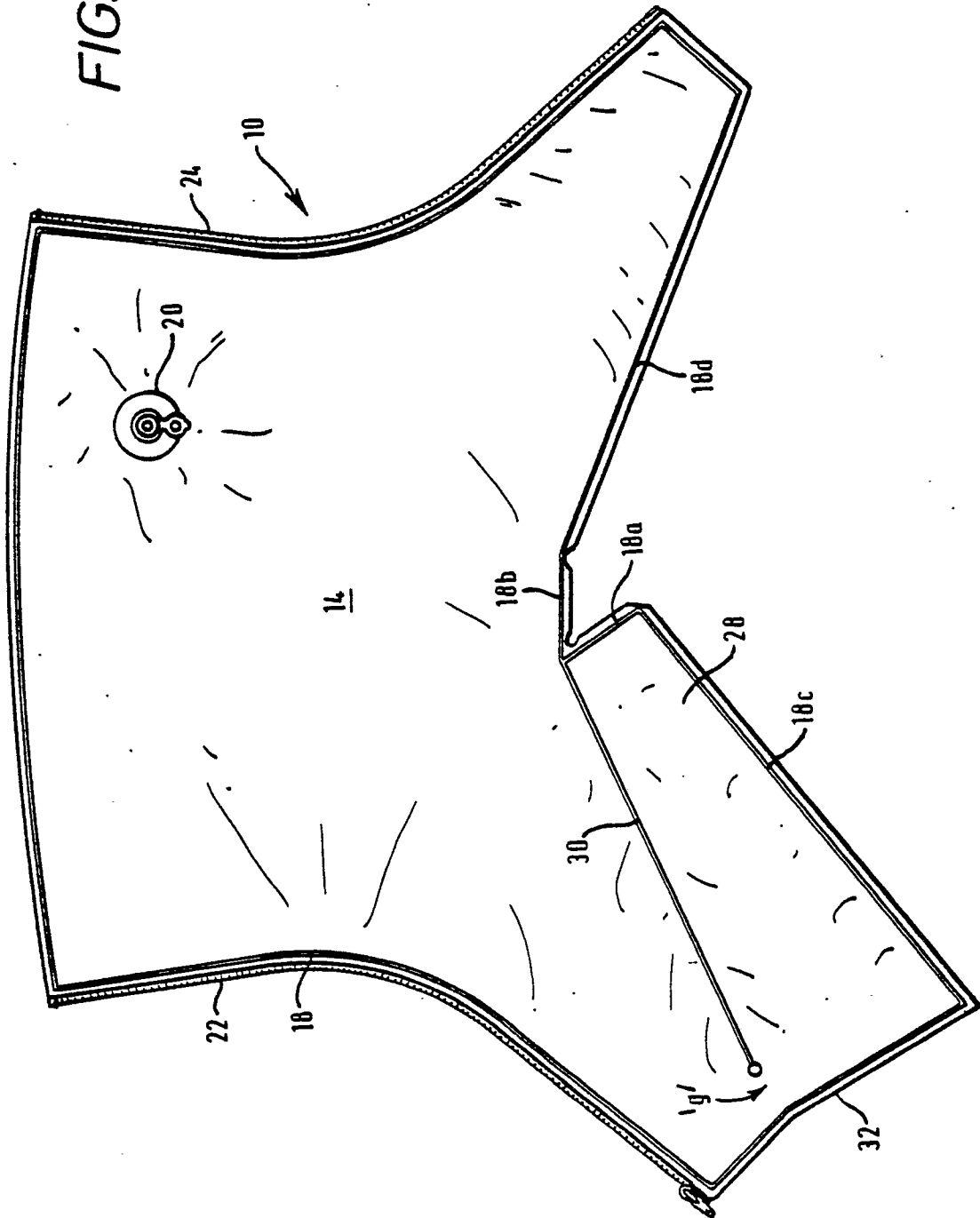
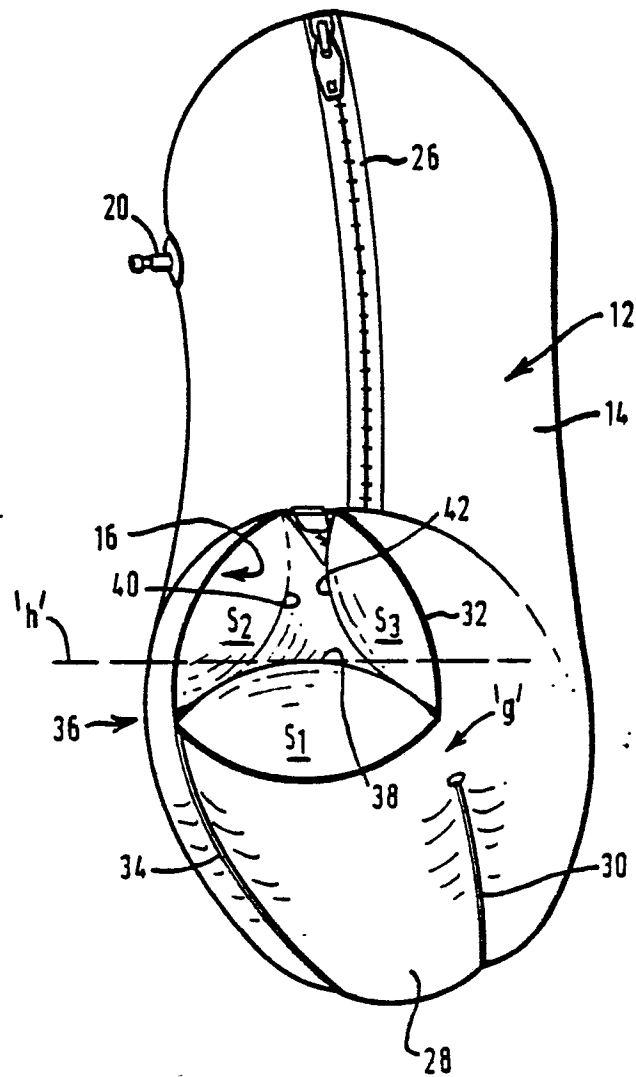


FIG. 2



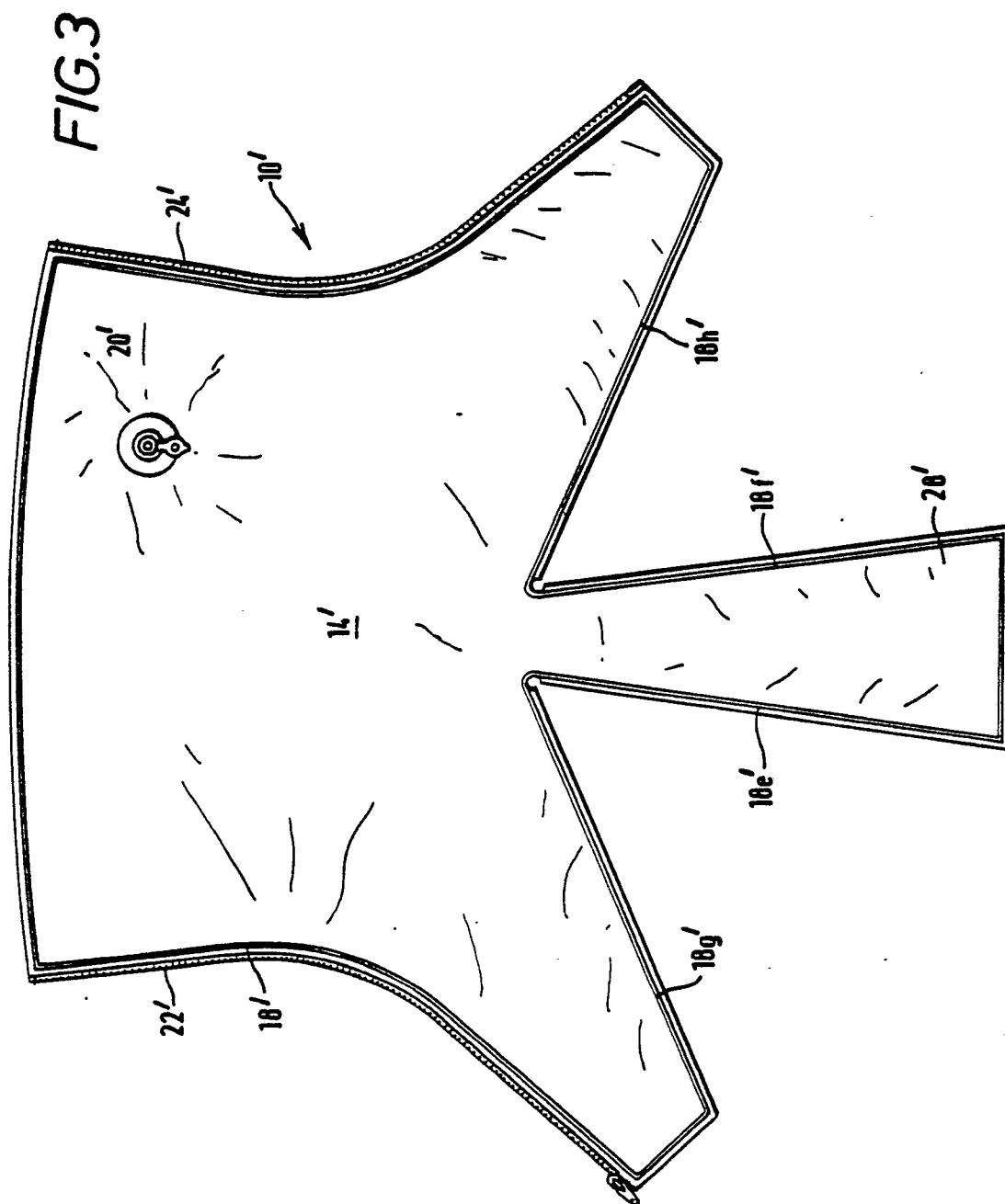


FIG. 4

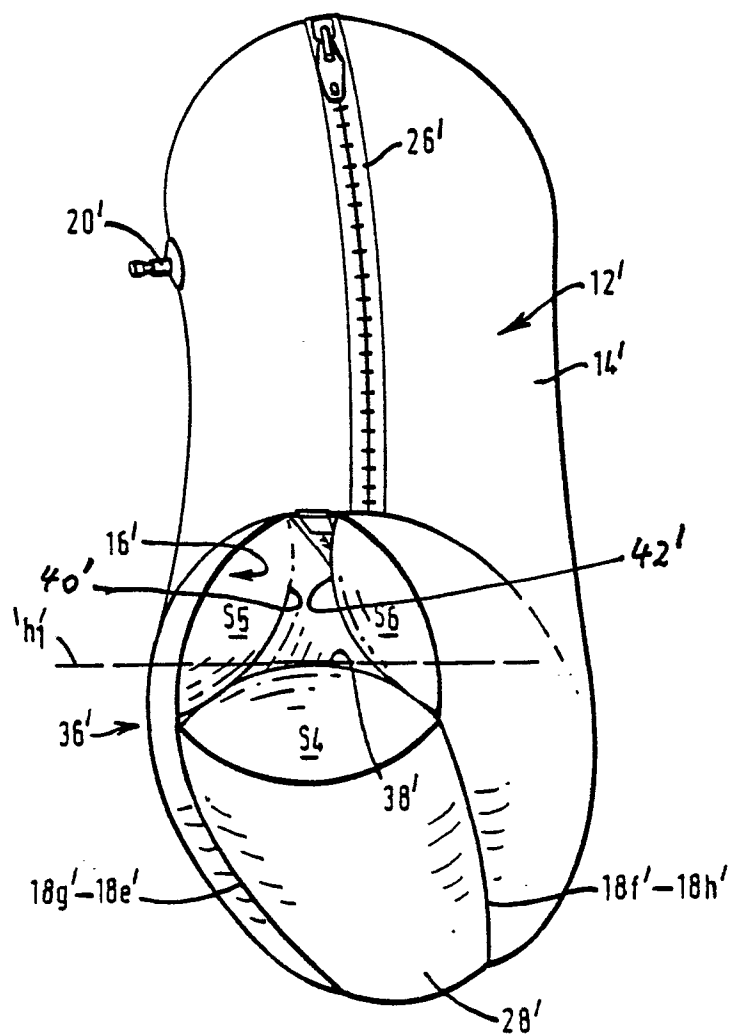


FIG.5

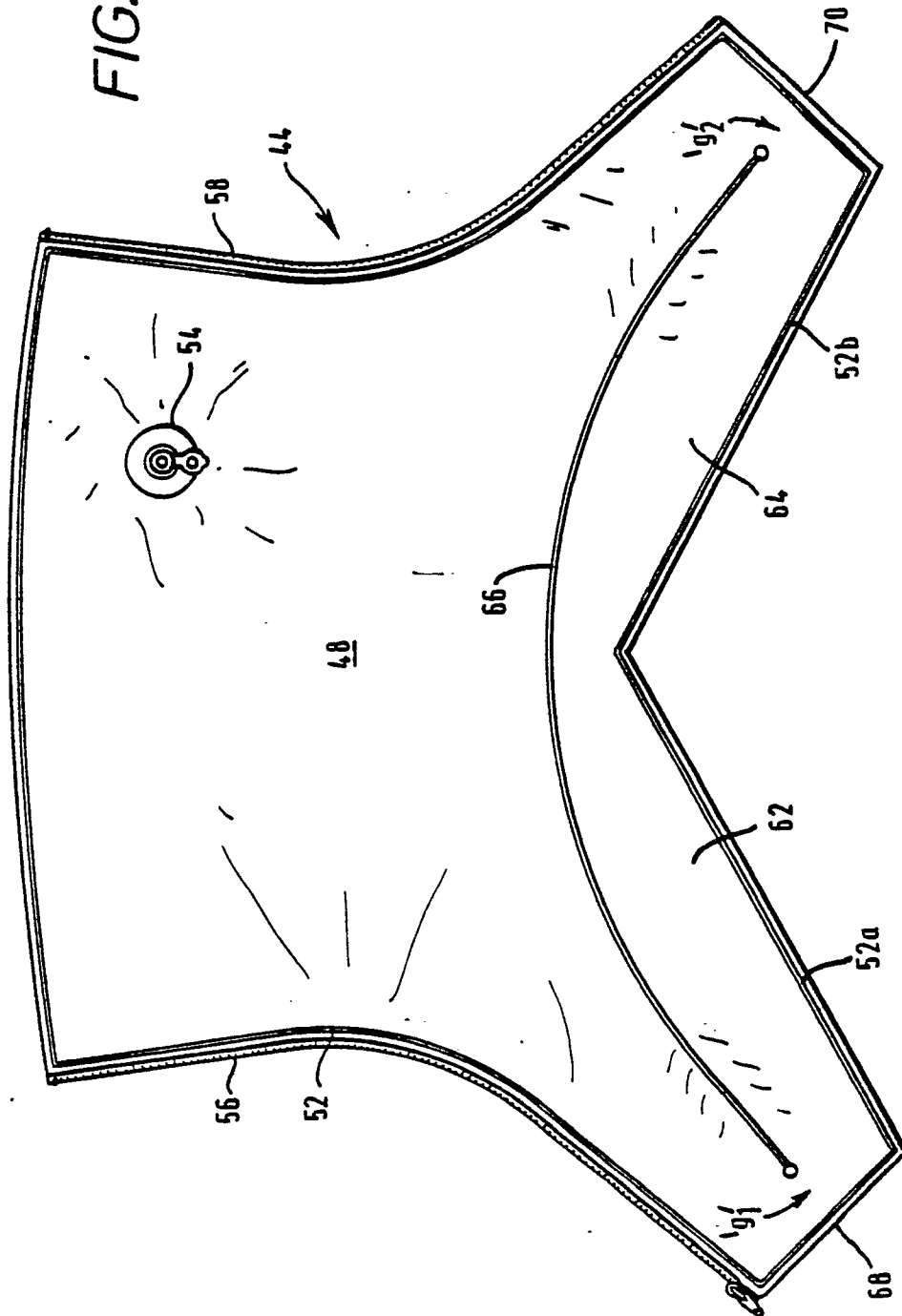


FIG. 6

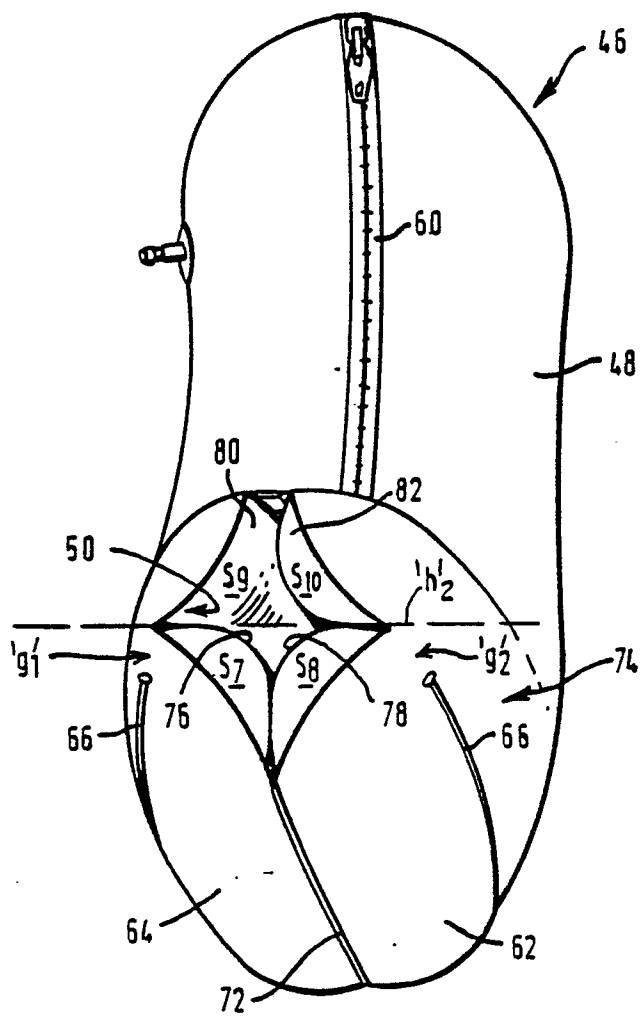


FIG. 7

